Commercial Electropolishing Unit

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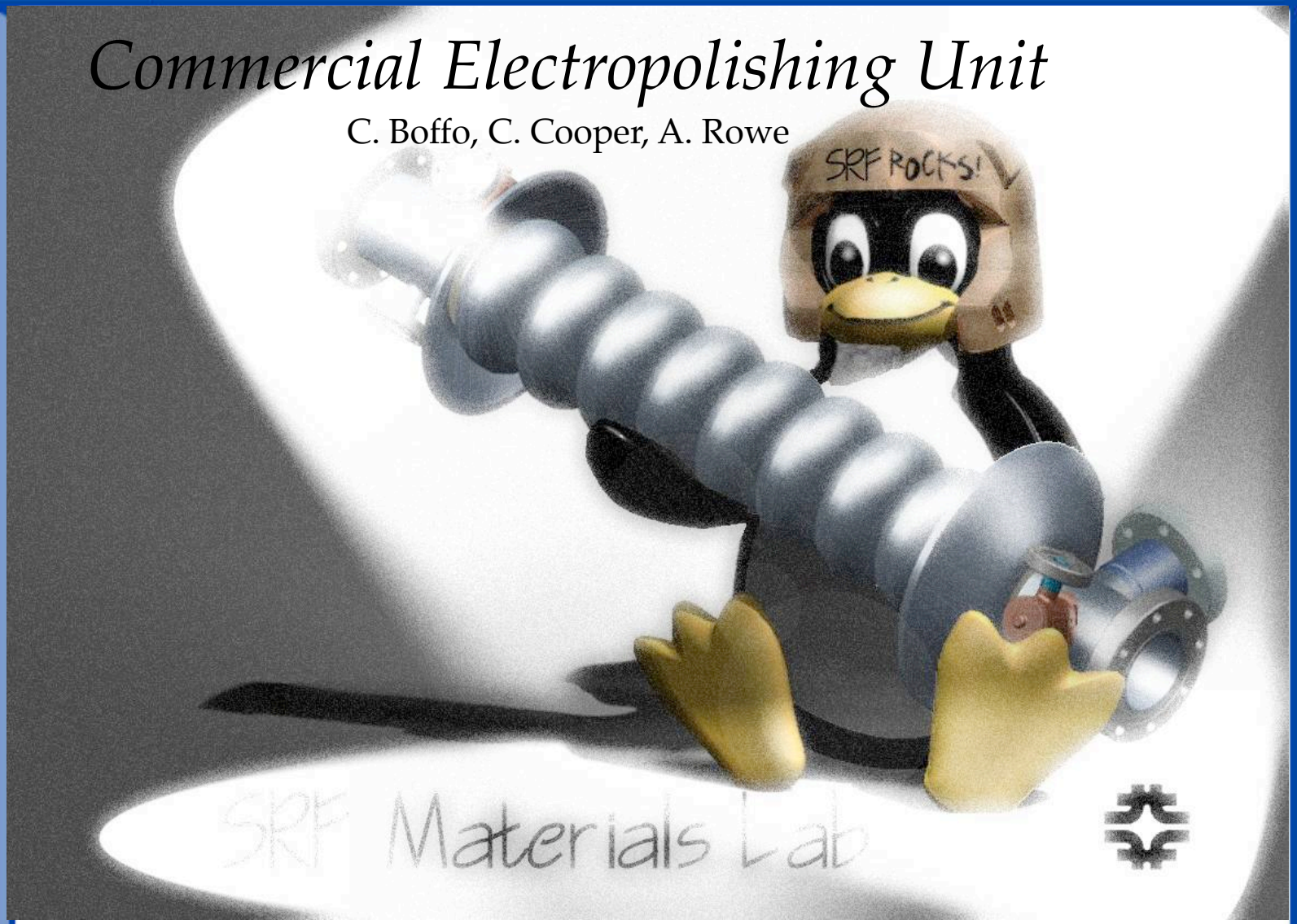
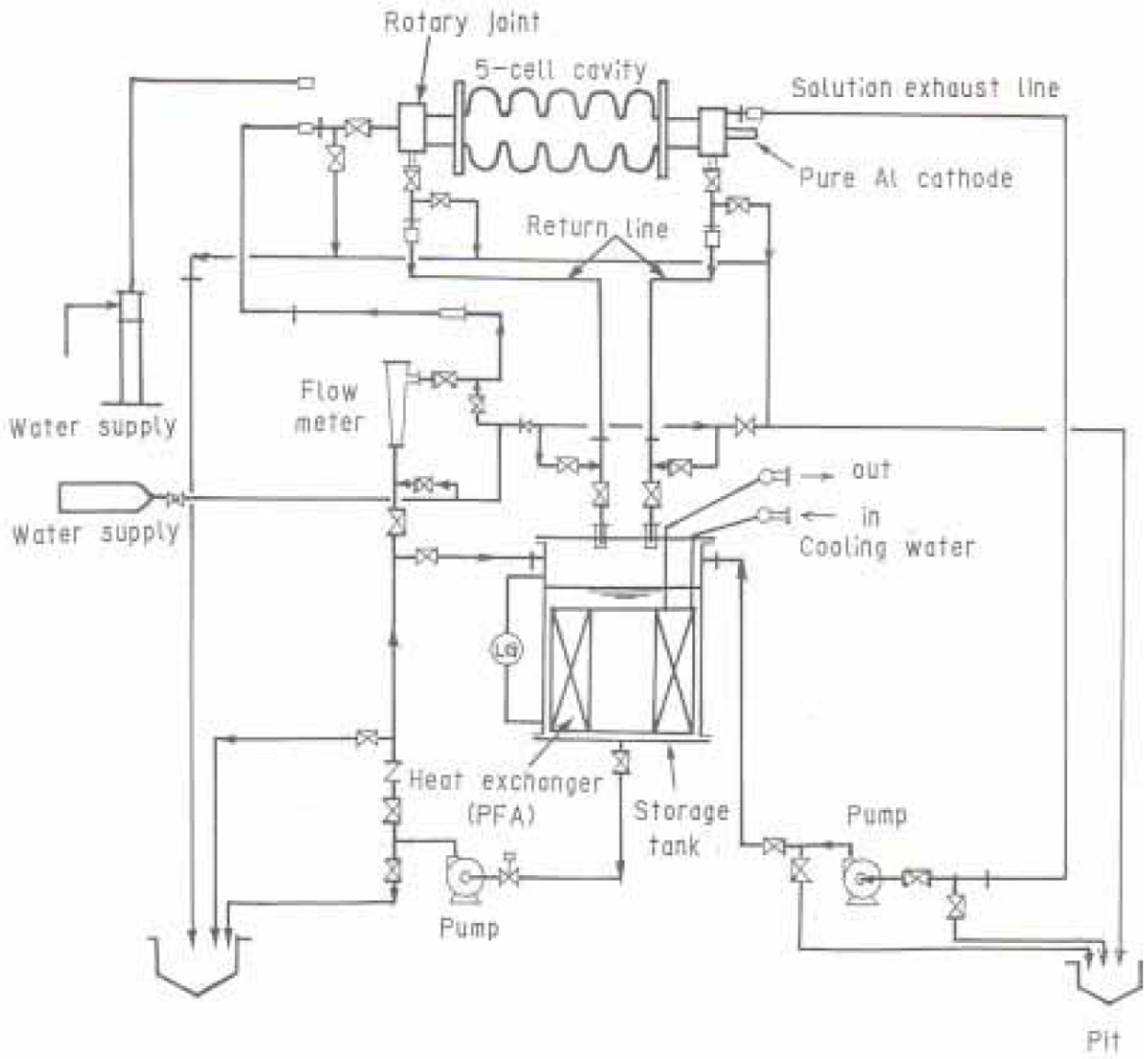
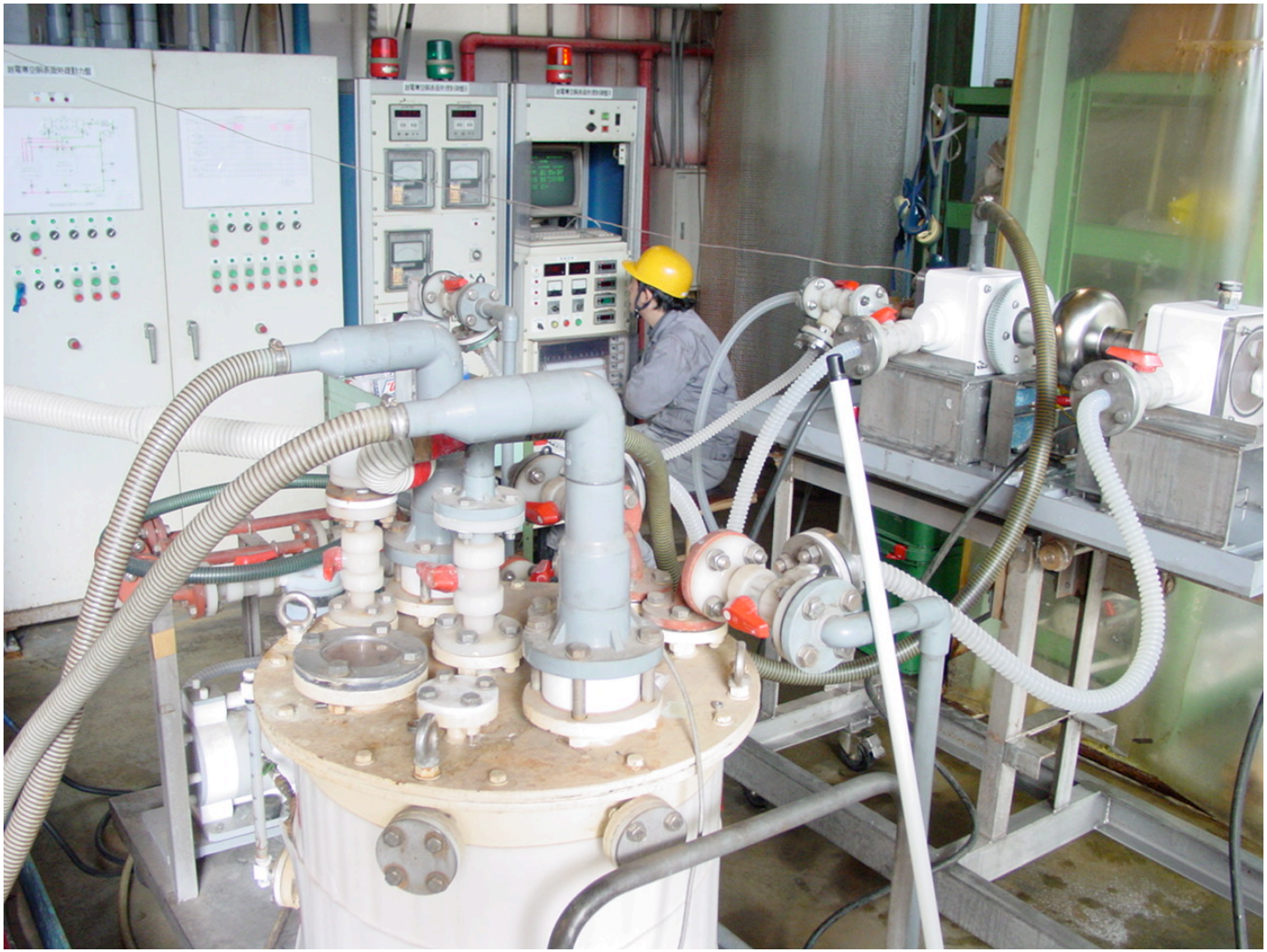


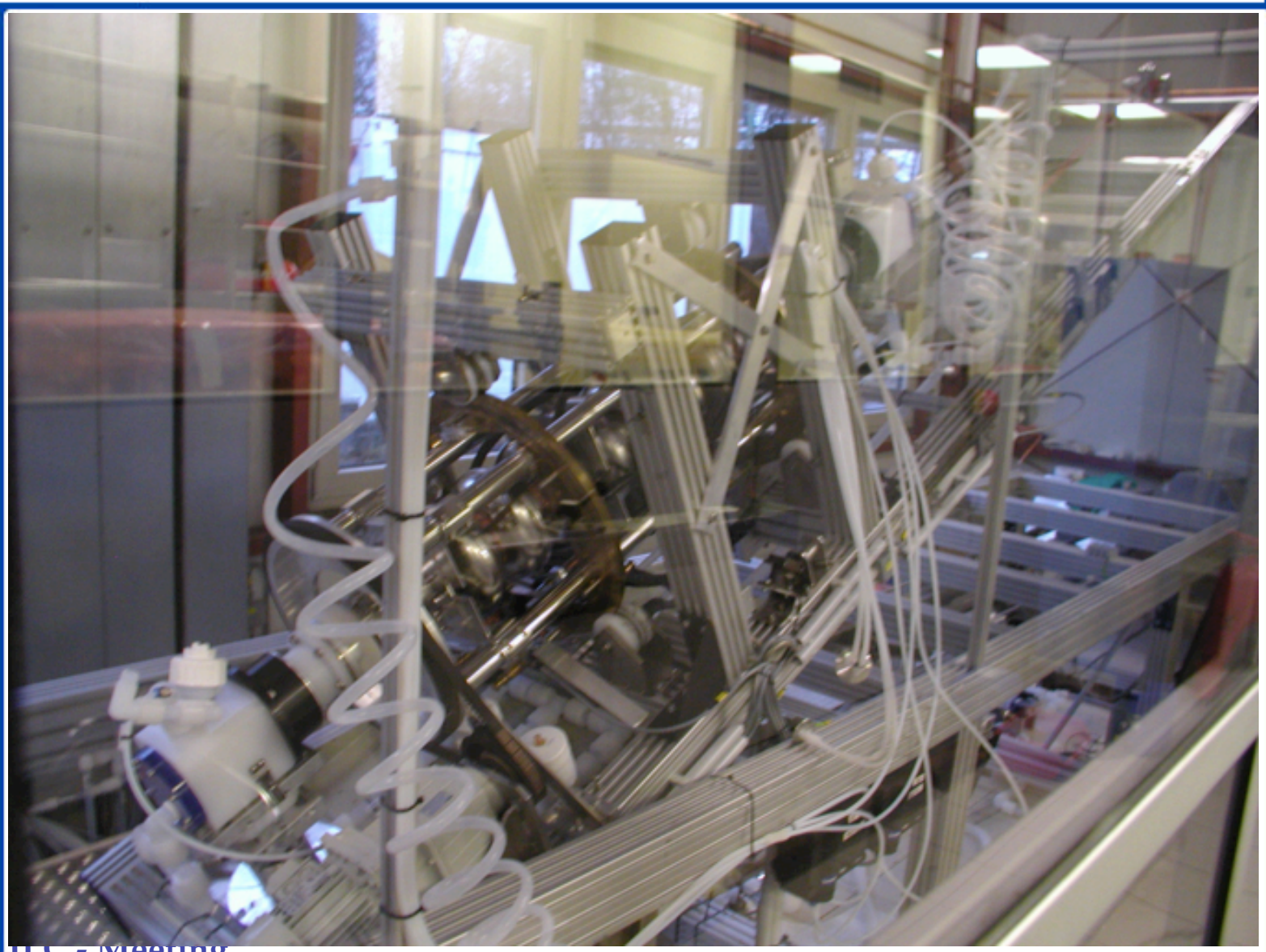
KEK Facility



KEK Facility



DESY Facility



J-Lab Example

- The J-Lab group has a strong experience in processing cavities for the SNS project.
- Their processing facility includes both a BCP unit and an EP unit (R&D)
- Both units are customizations of existing commercial products built by two different suppliers: Poly-Flow and SPEC
- The two companies are specialized in etching cabinets used in the semiconductor business
- The EP unit was built to spec. and according to J. Mammoser there would be a number of upgrades and changes he would apply if specifying a new unit.

Advantages of a commercial Unit

- Similar units are already operating in the semiconductor industry. This is typically the benchmark field in terms of cleanliness and assembly procedures we adopted in the SRF technology.
- The control system has been tested for reliability and robustness (we spent over one year at FNAL to develop the BCP control system). This is a key element when the repeatability of the process is a major goal. In order to guarantee repeatable results and at the same time pave the road to industrialization it is important to have a fully automated control system.
- The FNAL manpower involved would be minimal since most of the parts and design would be outsourced. This is one of the major reasons to choose a commercially available unit. The FNAL BCP facility design, although completed before the technological decision on the LC when the project had low priority, took more than 2 years.

Advantages of a commercial Unit

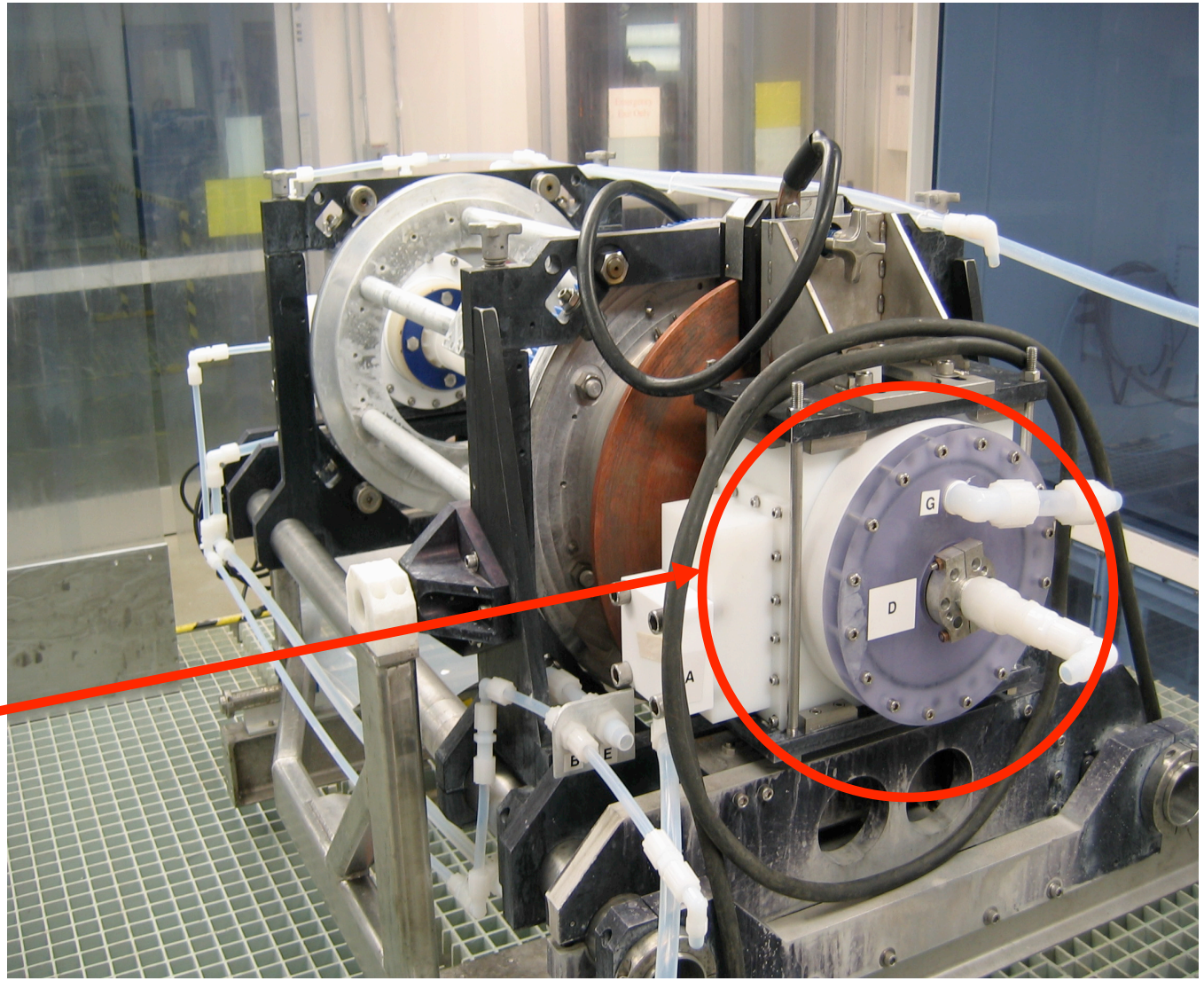
- The components will be designed with integration in mind and have already proven to work together. The design of the FNAL BCP facility showed us that the selection of the optimal components for such facility is one of the key elements. The type of acids involved in the Nb chemical processes greatly limit the allowed materials and as a consequence the devices available on the market.
- The assembly will be performed by trained personnel that are used to work on these units. This guarantees higher quality standards compared to built "in-house" units.
- The unit would be self contained and plug'n play. This is a very important aspect of the cabinet philosophy. The whole idea is that the cavity is quickly connected to the supporting fixture, the door of the cabinet is closed and the operator starts the process. The acid, the fumes, the acidic water are all contained in the cabinet. When the process is over and the cabinet is safe to open the operator can extract the processed cavity. This type of process minimizes the contact with acid and increases the safety of the operator.

Advantages of a commercial Unit

- The POSSIBLITY to commission a UNIVERSAL EP facility that allows companies involved in ILC cavity fabrication to buy the same unit in the future and perform EP directly at their factory.

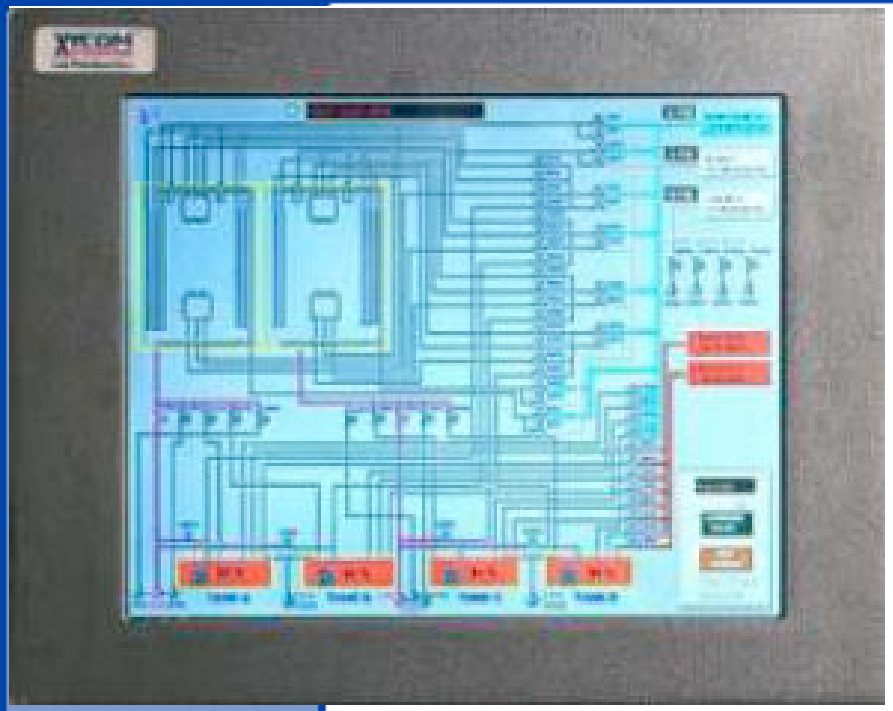
The J-Lab Unit

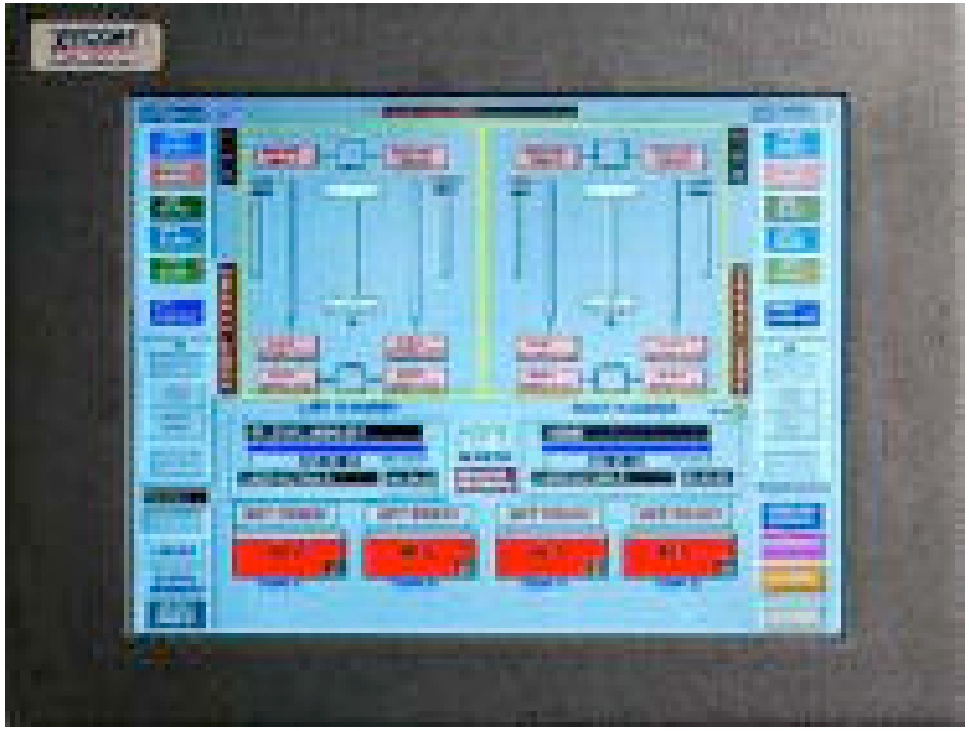
The J-Lab Unit



Japan

The J-Lab Unit





What the unit does include

The cabinet itself includes:

- the hydraulic system (valves, pumps, sensors)
- The electrical system
- the heat exchanger (immersed in the acid circulating bath)
- the control system (PLC controlled with PC HMI)
- the cavity support system (support and tilting)
- The Nitrogen purging (dry nitrogen supply is integrated in the unit)

These elements include basically all the acid wetted parts **(and relative controls and sensors)** of the EP facility excluding the two rotating heads that connect the cavity to the acid circuit.

The supplier (at least the one contacted) was willing to design additional elements including the rotating seals, cavity rotation and HF monitoring

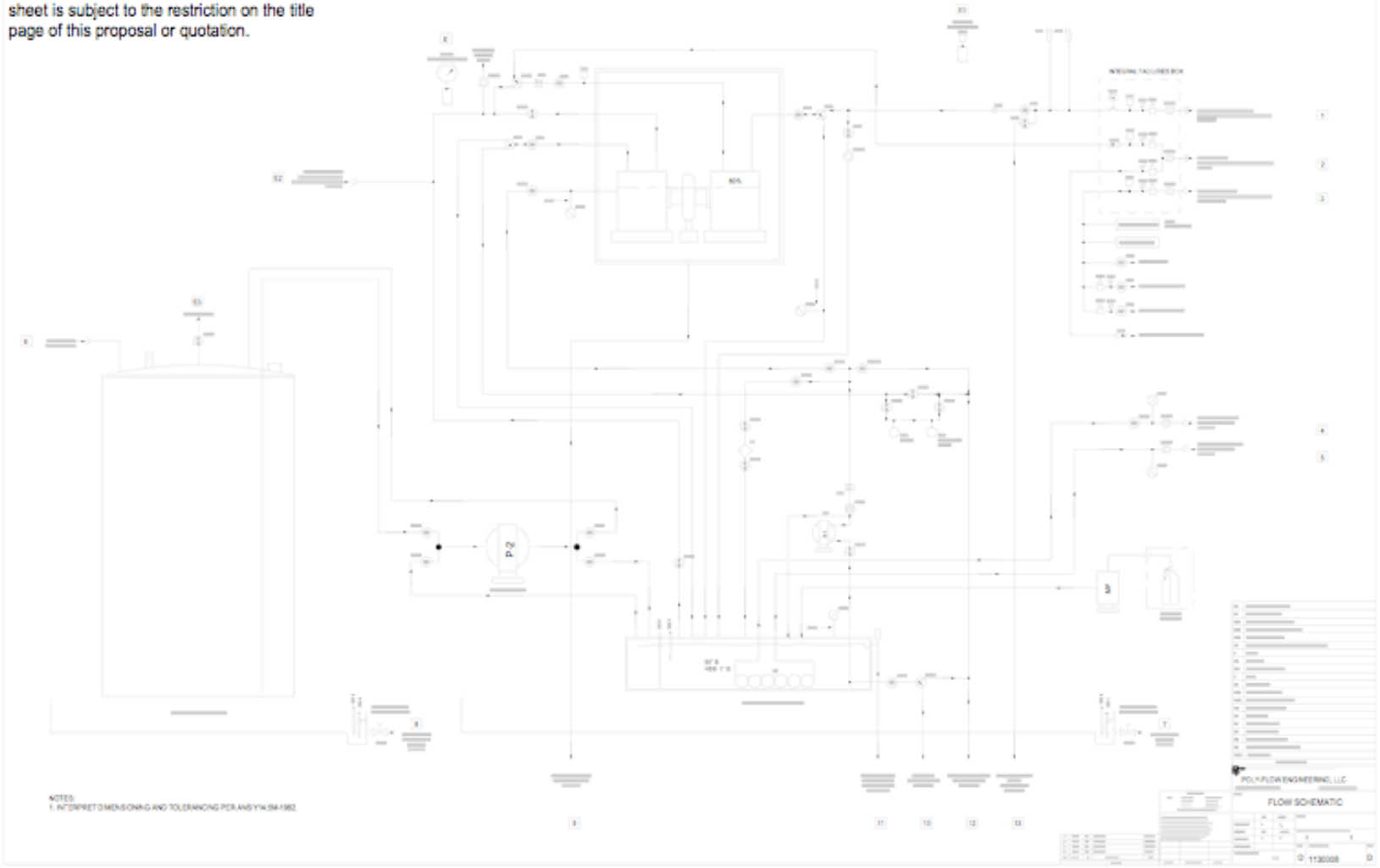
Optional

It is possible to connect the unit to a remote storage cabinet for the reagents. The storage cabinet is a self containing ventilated unit (similar to the one at DESY) that can be software interlaced to the EP tool to control the acid filling, damping, and possibly mixing

What the unit does NOT include

- The rotation of the cavity capability (but could be designed by the supplier)
- The acid concentration monitor/control (but could be added)
- The Power supply (20kW ?) (but the connectors are integrated in the unit)
- The UPW plant
- The scrubber and air quality monitors
- The water chiller (we have a 50kW unit in storage at FNAL)

Schematic



Control System

- PLC Based
- Logging can be enabled and designed as we specify
- Possible connection with separate DAQ system via PLC analog inputs
- Integrated safety controls
- Possibility to generate automatic recipes

Bottom Line

If correctly specified, it will be possible to obtain a flexible unit capable of investigating the EP parameter space in order to identify the optimal working condition and at the same time, thanks to a robust control system, guarantee a reproducible process.